

ON *VALVATA WOODWARDI*, N.SP., AND *SPHÆRIUM BULLENI*, N.SP., FROM THE CROMERIAN (FOREST BED) OF WEST RUNTON, NORFOLK.

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DURING the past few years a large quantity of material from the Cromerian (Forest Bed) of West Runton, Norfolk, has been placed at my disposal by M. A. C. Hinton, and I myself have also collected from the same deposit. A close study of this has revealed the necessity for a revision of the published lists of species, and considerable progress has been made. Since, however, it is unlikely that this will be finished for some little time I have considered it advisable to publish descriptions of these two new species, since it is necessary to quote them. The molluscan remains have been obtained from two distinct layers just east of West Runton Gap. The uppermost bed is a sandy gravel full of shells. It is about 8 inches thick and about 5 feet above the level of the beach. There can be no doubt that this is the bed described by Mr. Clement Reid¹ as—"Near West Runton Gap the bed is a loamy sand full of *Corbicula fluminalis* and *Paludina gibba*." As a matter of fact *Corbicula fluminalis* does not occur, the shell which has been mistaken for it being *Sphærium rivicola*, Leach. The other bed is one apparently older, and is a silty peat occurring on the foreshore, more to the eastward. Mr. Hinton informs me that, judging from the fossil Rodentia, there is considerable difference in age between the two, the palæontological evidence supporting the stratigraphical. Both the new species were very common in the upper bed, though not so abundant in the lower.

VALVATA WOODWARDI, n.sp.

Shell conical, solid, rather glossy, closely and finely striate in the lines of growth; whorls $4\frac{1}{2}$ –5, convex; body-whorl very large; apex somewhat sharply pointed; suture oblique, shallow; mouth oval,



angulated above; umbilical chink narrow; operculum unknown. Height 9, breadth 7 mm.

Locality and Formation.—West Runton, Norfolk: Cromerian (Forest Bed).

¹ *Pliocene Deposits of Britain* (Mem. Geol. Survey), 1890, p. 156.

Examples of this species were submitted to the late Dr. O. Boettger (whose death we so greatly deplore) and were pronounced by him to be new to science. There can be but little doubt that this is the *Valvata fluviatilis*, Colbeau, of F. Sandberger ("Ein Beitrag zur Kenntniss der unterpleistocänen Schichten Englands": Palæontographica, 1880, p. 100, Taf. xii, figs. 4-4b), and of Clement Reid (op. cit., pl. v, figs. 7a-b). *V. fluviatilis* is, however, only a form of *piscinalis*, and is much smaller than *Woodwardi*, besides differing in the suture, apex, and body-whorl. The nearest living ally of *Woodwardi* is *V. raticina*, Menke, a Central European species.

I have great pleasure in associating the name of our former President with this species as a slight recognition of his valuable services to Malacology.

SPHÆRIUM BULLENI, n.sp.

Shell ovate, nearly equilateral, very swollen, with front margin very curved, very slightly curved ventrally, anterior and posterior margins being almost equally semicircular. Exterior showing lines of increment at irregular intervals. Umbones nearly central, very prominent, tipped with the embryonic shell. Length 9, breadth 8, thickness 7 mm. The embryonic shell measures 2×1.5 mm.



Teeth: Right valve. Hinge-plate slightly curved either side of cardinal area. This curvature is greatly accentuated in old and thickened specimens by the great development of inner lateral teeth. Cardinal 3 almost semicircular, 3 b. bifid, and about twice the width of a.; lateral teeth very strong, especially inner ones, a.l. 1 stout and curved towards interior of shell, apex nearly median, the cardinal side being more steeply incurved; a.l. 3 short and stout, its apex the same distance from cardinal as a.l. 1; p.l. 1 straighter and narrower than a.l. 1, apical point less pronounced, and vertical ridge curves on either side nearly equal; p.l. 3 nearly as long as p.l. 1, its apex slightly nearer the cardinal than that of p.l. 1, the cardinal end of p.l. 3 considerably swollen and thickened as it approaches the ligament pit, which is long, narrow, and moderately deep.

Left valve. Cardinal teeth (c. 2) set obliquely across hinge-plate, forming angle of about 45° with lower margin, short, and moderately pointed; c. 4 longer, straighter, almost parallel with hinge-line, and stretching towards ligament pit, is almost twice the length of c. 2; lateral teeth projecting more beyond margin than those of right valve; apices towards the distal ends of ridges, which are boldly curved on cardinal and steeply curved on distal. The outline of apex curved away from cardinal region.

Examples of this *Sphærium* were also submitted to the late Dr. O. Boettger, who pronounced them to belong to a new species. He stated that its nearest ally was *Sphærium mamillanum*, West., but that it differed from that species in being larger (Westerlund's dimensions for his species being $8 \times 5\frac{1}{2} \times 4\frac{1}{2}$ mm.), in the umbo being far more prominent, and in being a far thicker shell. This species is the *S. ovale*, Fér., of Clement Reid (op. cit., p. 230).

Locality and Formation.—Cromerian (Forest Bed) of West Runton, Norfolk.

It affords me great pleasure to associate with this species the name of the Rev. R. Ashington Bullen, B.A., whose enthusiasm in the interests of science is well known to all members of this Society.
